

CLAIMS:

[C001] 1. An imaging system comprising:

one or more distributed X-ray sources configured to generate X-ray radiation towards an imaging volume; and

one or more detectors for receiving the X-ray radiation after attenuation in the imaging volume and processing corresponding signals to produce measurement data,

wherein the distributed X-ray sources and/or the detectors are arranged about a scanner aperture such that at least one of the X-ray sources or detectors rotate in relation to the imaging volume during an imaging sequence.

[C002] 2. The imaging system of claim 1 wherein the one or more distributed X-ray sources comprises at least one stationary distributed source positioned about a scanner aperture and the one or more detectors comprises at least one distributed detector configured to rotate around a scanner aperture.

[C003] 3. The imaging system of claim 2 wherein the one or more distributed X-ray sources includes one or more two-dimensional arrays of source elements extending substantially around the aperture.

[C004] 4. The imaging system of claim 2 wherein the one or more distributed X-ray sources includes one or more two-dimensional arrays of source elements extending around a portion of the aperture.

[C005] 5. The imaging system of claim 2 wherein the one or more distributed X-ray sources includes one or more one-dimensional arrays of source elements extending substantially around the aperture.

[C006] 6. The imaging system of claim 5 further comprising:

one one-dimensional array of source elements extending substantially around the aperture; and
one or more line sources.

[C007] 7. The imaging system of claim 5 further comprising:

two or more one-dimensional arrays of source elements extending substantially around the aperture; and
one or more line sources.

[C008] 8. The imaging system of claim 2 wherein the one or more distributed X-ray sources includes one or more one-dimensional arrays of source elements extending around a portion of the aperture.

[C009] 9. The imaging system of claim 2 wherein the at least one distributed detector includes one or more two-dimensional arrays of detector elements extending around at least a portion of the aperture.

[C010] 10. The imaging system of claim 2 wherein the at least one distributed detector includes one or more one-dimensional arrays of detector elements extending around at least a portion of the aperture.

[C011] 11. The imaging system of claim 2 wherein the one or more distributed X-ray sources includes one or more line sources.

[C012] 12. The imaging system of claim 1 wherein the one or more distributed X-ray sources includes a plurality of independently addressable source elements arranged in one or more arrays.

[C013] 13. The imaging system of claim 1 wherein the one or more distributed X-ray sources comprises:

a cold cathode emitter housed in a vacuum housing; and,

a stationary anode disposed in a vacuum housing and spaced apart from the cold cathode emitter.

[C014] 14. The imaging system of claim 1 wherein the one or more distributed X-ray sources comprises addressable emission devices and the emission devices comprises thermionic emitters, cold-cathode emitters, carbon-based emitters, photo emitters, ferroelectric emitters, laser diodes or monolithic semiconductors.

[C015] 15. The imaging system of claim 1 wherein the one or more distributed X-ray sources comprises at least one distributed source configured to rotate around the scanner aperture and the one or more detectors comprises at least one stationary and distributed detector positioned about the scanner aperture.

[C016] 16. The imaging system of claim 15 wherein the at least one distributed source includes one or more two-dimensional arrays of source elements.

[C017] 17. The imaging system of claim 15 wherein the at least one distributed source includes one or more one-dimensional arrays of source elements.

[C018] 18. The imaging system of claim 15 wherein the one or more one-dimensional arrays of source elements extend around at least a portion of the aperture.

[C019] 19. The imaging system of claim 18 further comprising a one-dimensional array of source elements extending around at least a portion of the aperture, and one or more line sources.

[C020] 20. The imaging system of claim 18 further comprising two or more one-dimensional arrays of source elements extending around at least a portion of the aperture and one or more line sources.

[C021] 21. The imaging system of claim 17 wherein the at least one of the one or more one-dimensional arrays of source elements include at least one line source extending at least along a Z-direction.

[C022] 22. The imaging system of claim 21, wherein the at least one line source comprises a target configured as a hollow cylinder rotating around its axis.

[C023] 23. The imaging system of claim 15 wherein the at least one stationary and distributed detector includes one or more two-dimensional arrays of detector elements extending substantially around the aperture.

[C024] 24. The imaging system of claim 15 wherein the at least one stationary and distributed detector includes one or more two-dimensional arrays of detector elements extending around a portion of the aperture.

[C025] 25. The imaging system of claim 15 wherein the at least one stationary and distributed detector includes one or more one-dimensional arrays of detector elements extending substantially around the aperture.

[C026] 26. The imaging system of claim 15 wherein the at least one stationary and distributed detector includes one or more one-dimensional arrays of detector elements extending around a portion of the aperture.

[C027] 27. The imaging system of claim 1 wherein the one or more distributed X-ray sources comprises at least one distributed source configured to rotate around the scanner aperture and the one or more detectors comprises at least one distributed detector configured to rotate around a scanner aperture.

[C028] 28. The imaging system of claim 27 wherein the at least one distributed source includes one or more two-dimensional arrays of source elements.

[C029] 29. The imaging system of claim 27 wherein the at least one distributed source includes one or more one-dimensional arrays of source elements.

[C030] 30. The imaging system of claim 27 wherein the one or more one-dimensional array of source elements extend around at least a portion of the aperture.

[C031] 31. The system of claim 30 further comprising a one-dimensional array of source elements and one or more line sources.

[C032] 32. The system of claim 30 further comprising two or more one-dimensional arrays of source elements and one or more line sources.

[C033] 33. The imaging system of claim 29 wherein at least one of the one or more one-dimensional arrays of source elements includes at least one line source extending at least along a Z-direction..

[C034] 34. The imaging system of claim 33, wherein the at least one line source comprises a target configured as a hollow cylinder rotating around its axis.

[C035] 35. The imaging system of claim 27 wherein the at least one distributed detector includes one or more two-dimensional arrays of detector elements extending around at least a portion of the aperture.

[C036] 36. The imaging system of claim 27 wherein the at least one distributed detector includes one or more one-dimensional arrays of detector elements extending around at least a portion of the aperture.

[C037] 37. An X-ray imaging system for scanning a volume to be imaged, the system comprising:

one or more distributed X-ray sources substantially surrounding an imaging volume and configured to emanate an X-ray radiation;

a control circuit operably coupled to the distributed X-ray sources; one or more detectors for receiving the X-ray radiation after attenuation in the imaging volume;

a motor controller configured to displace at least one of the distributed X-ray sources, and the detectors;

a processing circuit operably coupled to the detectors configured to receive the plurality of projection images and to form one or more reconstructed slices representative of the volume being imaged; and

an operator workstation operably coupled to the processing circuit configured to display the one or more reconstructed slices,

wherein the distributed X-ray sources and/or the detectors are arranged about a scanner aperture such that at least one of the X-ray sources or detectors rotate in relation to the imaging volume during an imaging sequence.

[C038] 38. The X-ray imaging system of claim 37 wherein the one or more distributed X-ray sources comprises at least one stationary distributed source positioned about a scanner aperture and the one or more detectors comprises at least one distributed detector configured to rotate around a scanner aperture.

[C039] 39. The X-ray imaging system of claim 37 wherein the one or more distributed X-ray sources comprises at least one distributed source configured to rotate around the scanner aperture and the one or more detectors comprises at least one distributed detector configured to rotate around a scanner aperture.

[C040] 40. The X-ray imaging system of claim 37 wherein the one or more distributed X-ray sources comprises at least one distributed source configured to rotate around the scanner aperture and the one or more detectors comprises at least one stationary and distributed detector positioned about the scanner aperture.

[C041] 41. A method of scanning a volume to be imaged, the method comprising:
providing one or more distributed X-ray sources for generating X-ray radiation towards an imaging volume; and

providing one or more detectors for receiving the X-ray radiation after attenuation,

wherein generating and receiving the X-ray radiation is accomplished by rotating at least one of the distributed X-ray sources or detectors in relation to the imaging volume during an imaging sequence.

[C042] 42. The method of claim 41 wherein providing the one or more distributed X-ray sources comprises providing at least one stationary distributed source positioned about a scanner aperture and providing the one or more detectors comprises providing at least one distributed detector configured to rotate around a scanner aperture.

[C043] 43. The method of claim 41 wherein providing the one or more distributed X-ray sources comprises providing at least one distributed source configured to rotate around the scanner aperture and providing the one or more detectors comprises providing at least one distributed detector configured to rotate around a scanner aperture.

[C044] 44. The method of claim 41 wherein providing the one or more distributed X-ray sources comprises providing at least one distributed source configured to rotate around the scanner aperture and providing the one or more detectors comprises providing at least one stationary and distributed detector positioned about the scanner aperture.